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QUARTERLY PROGRESS REPORT

Project Title:	New Jersey Department of Transportation Elimination of Weight Restrictions on Amtrak, NJ Transit, and Conrail Lines		
Project NUMBER: NJDOT Project #2010-11	NJDOT RESEARCH PROJECT MANAGER: Edward S. Kondrath		
TASK ORDER NUMBER: N/A	PRINCIPAL INVESTIGATOR: Dr. Hani Nassif		
Project Starting Date: 01/01/2010 Original Project Ending Date: 6/30/2011 Modified Completion Date:	Period Starting Date: 07/01/2010 Period Ending Date: 09/31/2010		

1. Project Progress Summary

<u>Task No.</u>	<u>Task Description</u>	<u>Percent of Total Project Budget</u>	<u>Cost of Task</u>	<u>% of task this quarter</u>	<u>Cost this quarter</u>	<u>% of task to date</u>	<u>Total Cost to date</u>
1	Literature Search	15%	\$28,564	0%	\$0	100%	\$28,564
2	Bridge Inspection	20%	\$38,085	20%	\$7,617	95%	\$36,361
3	Load Rating and Finite Element Modeling	30%	\$57,128	47%	\$27,041	84%	\$47,831
4	Field Tests and Load Rating using the Test Results	25%	\$47,606	40%	\$19,043	70%	\$33,324
5	Recommendation and Plan for Weight Increase and Bridge Maintenance	5%	\$9,521	10%	\$952	20%	\$1,904
6	Implementation and Quarterly Report	5%	\$9,521	10%	\$952	30%	\$2,856
Total		100%	\$190,425	29%	\$55,605	79%	\$150,840

2. Project Overview

2.1. Project Objectives

The main objective of this study is to evaluate current conditions of various railroad bridges, and load-rate the bridges according to AREMA provisions to allow travels of 286-kip railcars. Additional field tests and detailed finite element analysis will be conducted for more accurate condition evaluation of the bridges. Recommendations for appropriate maintenance of the bridges will be provided to operate the bridges safely and cost-effectively for the remaining life of the bridges. Based on the study of the selected railway bridges, general guidelines for bridge inspection and maintenance will also be provided in this study.

2.2. Project Abstract

The overall growth in the economy and population in the United States led to a significant expansion of railroad traffic levels by the late 1990s. The freight railroad system facilitates large volume of freight movement cost-effectively. The railroad system is obviously important because the other alternative transportation methods, such as vehicles and trucks, cause concerns about congestion, air quality, and safety. Moreover, the cost to build and maintain new infrastructure and equipment is extremely high. Many railroad bridges were built before World War II approaching their design lives, and freight railcars, in many cases, use passenger rail systems to reduce maintenance cost.

In New Jersey freight railcars travel over many passenger rail systems. Recent increase of railcar weight limits from 263,000 lb to 286,000 lb raised additional concerns for the passenger rail systems since the bridges in the passenger rail system were not designed based on the increased railcar weight. Impact of the railcar weight on those bridges should be evaluated first to allow the use of passenger lines for the freight travels.

In this study, the impact of the increased railcar weight was investigated on the bridges located in New Jersey. The research approach adopted by the RIME team is aiming at evaluating current load-carrying capacity of various types of bridges and providing recommendations for load rating, repair, and maintenance to allow 286,000-lb railcar traffic on the passenger lines.

More detailed literature review will be conducted to find similar previous research and practices, followed by a review of inspection reports of all bridges. In cases where inspection reports are not available or there is lack of information, current bridge conditions and actual dimensions of the bridges can be evaluated from field inspections. Based on the field inspections, a number of critical bridges on New Jersey's rail lines will be selected and load-rated based on the current American Railway Engineering and Maintenance-of-Way Association (AREMA) specifications as well as the analytical studies. Enough number of sample bridges will be selected, so that the selected bridges can represent bridges with various structural systems and material types. Finite element modeling will be also adopted for the more accurate assessment of the bridges and to develop a methodology for evaluating and load-rating railroad bridges. Based on the field inspection results, critical bridge(s) will be selected for field tests. The selected bridges will be instrumented and tested under live loads (moving railcars). Finally, recommendations for load rating, maintenance, repair, and rehabilitation of the bridges will be provided for safe operation of the bridges on various New Jersey lines. The recommendations

will be applicable for other railroad bridges that support railcars with the increased standard weight.

Briefly, this project will address problems with the existing railroad bridges under the increased railcar loading. From this research, the RIME research team will provide guidelines for the inspection, maintenance, and load rating of the existing railroad bridges as well as the cost-effective analysis of this change in the freight weight limits.

3. Description of Work Completed by Task over This Period

Task 1— Literature Search

- This task has been finalized.

Task 2— Review of Bridge Inspection Reports and Coordination of Tasks

- Bridge Inspection Reports were reviewed to determine the sensor locations.
- Rutgers and Arora & Associates, P.C. coordinated efforts and finalized the selection of the bridges after concluding the checking of the load rating computations and reviewing past inspection findings.
- The research team coordinated with rail-line owners and other agencies to obtain the inspection and maintenance information for other target bridges.
- For selected bridges, field inspection were arranged and coordinated with rail lines owners to evaluate access to the selected bridges and their current conditions. The bridge inspection reports and field inspection results were used for accurate bridge load rating.
- This task has been finalized.

Task 3— Load rating and Finite Element Modeling

- Load rating calculations were carried out for all bridges and checked by Arora and Associates.
- Finite Element Modeling is being finalized for all five bridges. Preliminary Load rating for controlling structural members was performed on 5 Bridges with 286 kips Rail Car loading.
- Both as-built and as-inspected section properties were taken into account in the finite element modeling of the bridges. The loading rating results based on FE Modeling were compared with loading rating based on sample beam analysis.

Task 4— Field Tests and Bridge Load Rating using Field Test Results

- Selected two NJ Transit bridges for inspection and filed observations and testing.
- Sensor Implementation has been finished for Main Line 15.95 and 15.14. Sensors were installed on these two NJ Transit bridges. Limited field tests were performed using regular passenger train loading to make sure that all sensors and systems are working properly. Strain and deflection data were collected and the train passage times were noted for future reference and comparison.
- Three sensors on one of the bridges were vandalized and stolen. These sensors will be replaced and re-installed on the day of field-testing the 286 rail car. As of last Monday, all other sensors were still installed and preserved.

- The Rutgers team is coordinating efforts with NJ Transit and Conrail to obtain a 286 kips rail car needed for field-testing of the two bridges.

Task 5— Recommendation and Plan for Weight Increase and Bridge Maintenance

- N/A.

Task 6— Implementation and Quarterly Progress Report

- Third quarter report has been submitted.

4. Proposed activities for next quarter by task:

Task 1— Literature Search

This task is finalized.

Task 2— Review of Bridge Inspection Reports and Coordination of Tasks

This task is finalized.

Task 3— Load Rating and Finite Element Modeling

- The team is finalizing the Finite Element Modeling for all the NJ Transit bridges.

Task 4— Field Tests and Bridge Load Rating using Field Test Results

- Perform the Load Test for the 286 railcar when provided by NJ Transit.
- Coordinate test date with NJ Transit and Arora and Associates, PC.
- Validate FE Models from preliminary field test data obtained from regular train tests and include calibration of FE models using the 286 rail car field tests.

Task 5— Recommendation and Plan for Weight Increase and Bridge Maintenance

- Compare various methods for load rating.

Task 6— Implementation and Quarterly Progress Report

- Third quarter report will be prepared for NJDOT.

3. List of deliverables provided in this quarter by task (product date):

Installed Sensors on Two Bridges for field tests

Finalized all load rating calculations on all 5 NJ Transit bridges

4. Progress on Implementation and Training Activities:

N/A

5. Problems/Proposed Solutions:

N/A

Year 1 Budget	\$190,425
Year 1 & 2 Cumulative Budget (Pending 01/01/11)	\$302,571
Total Project Expenditure to date	\$150,840
% of Total Project Budget Expended	50%

NJDOT Research Project Manager Concurrence: _____ Date: _____